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ABSTRACT

Described are procedures used to assess reasoning in congenitally blind students. It is explained that the Piagetian Battery of Reasoning Assessments for concrete and formal or abstract thought measures the following basic abilities: reversability of thought, classificatory thought, spatial orientation, and mental imagery. (CL)

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COGNITIVE REMEDIATION OF BLIND STUDENTS: FINAL REPORT AND DEMONSTRATION OF EDUCATIONAL TECHNIQUES

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Congenitally blind persons generally are classified as persons who have a sensory deficit because they do not experience input from the visual channel. An accompanying deficit can be termed an "interaction deficit". From birth onward blind persons have not engaged in the spontaneous interaction with objects and people that is so characteristic of their sighted peers. The visual channel can be regarded as a motivating channel; the sight on an object motivates a person to interact with it, and this interaction promotes cognitive development. Piaget, the Swiss psychologist, has been termed a developmental psychologist because he has traced cognitive development from its origins in infancy through childhood and adolescence to its evolution into abstract, adult thought. In doing so he has identified and described four stages of cognitive development; reasoning is the area of cognitive development to which he has accorded major emphasis. Because of his interest in cognitive processes he is termed a developmental or cognitive psychologist. Yet Piaget also can be termed an "interactionist" because he holds that cognitive development or the ability to reason proceeds as a person interacts with the objects and persons around him. Although he has not stated it quite so tersely he has inferred "no interaction-no development".

Initially the infant interacts with objects in a more or less aimless way, but, before many weeks of life pass, interaction becomes purposeful. The hand moves toward an object in order to clasp it; a bottle is held and tilted so that milk can be obtained from it. As cause and effect or mean-ends relationships are understood interaction becomes goal directed. Reasoning is evidenced when objects are examined and manipulated in a trial and error manner as the child attempts to use them to accomplish a desired act. For example, through experience the young child learns that to get a drink, water must be poured into a cup, not on the bottom of it.

To trace, analyze, or examine the development of reasoning Piaget and his colleagues have devised a battery of reasoning assessments which are designed to assess reasoning which is characteristic of normal children who are at the stage of concrete thought, i.e., who can reason logically if the task involves concrete objects. Normal, sighted children generally attain and perfect the ability to reason concretely between their sixth and twelfth years. Additional measures have been devised which measure formal or abstract thought, i.e., the ability to reason abstractly without recourse to concrete objects. This stage of formal or abstract thought generally is achieved in normals, IQ 90-110, between their sixteenth or eighteenth to their twentieth or twenty-second years.

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The Piagetian Battery of Reasoning Assessments for concrete and formal or abstract level thought has been adapted by Simpkins and Stephens for use with blind subjects. In the presently reported study they were administered to a group of blind subjects in order to determine their attained level of reasoning. Before discussing the findings obtained from the study it seemed appropriate to review the procedures and techniques used to assess reasoning, and to consider the basic abilities that were measured by these assessments.

Reversability of thought is measured by a group of assessments termed "conservation measures". The ability that is analyzed is the ability to reverse your thought processes, to think back in time and compare a previous state of an object with its present state or shape, and to determine if the quantity of substance contained in the object is the same although the shape has changed. One measure of this ability is termed "Conservation of Substance". In this assessment the child agrees that two identical balls of clay contain the same amount of clay and also agrees that there continues to be the same amount even when one ball is successively transformed into a "hot dog", "pancake", or into a dozen small pieces. The reasoning required in this assessment involves understanding of the invariance of quantity, the realization that quantity is constant although the shape of an object may undergo changes. In order to realize that the ball and hot dog contain the same amount of clay although the hot dog looks longer, the child must reverse this thought processes and think back in time to remember that before the clay was rolled into a hot dog it was a ball the same size as the other ball. The child must also realize that nothing was added and nothing was taken away, therefore, (his thoughts move from the past back into the present) they must still be the same. The numerous Piagetian conservation experiments all tap this reversibility of thought processes.

One-for-one exchange
Term-to-term correspondence
Conservation of substance
Conservation of weight
Conservation of volume - also formal
Conservation of length
Conservation of length - rod sections
Conservation of liquids
Dissolution of sugar
Dissociation of notions of weight and volume

Assessments involving logical classification represent another area, an area which is labelled "classificatory thought". In these assessments the ability to group and regroup objects to categorize and subcategorize is measured. One example is an assessment termed Class Inclusion-Foods. The task requirements are to sort food into three related stacks - apples, fruits, and other foods. After he has sorted them into these three categories the subject is questioned on class inclusion and possible class extension (e.g., "Can you group the apples with the fruits and keep the label "fruits" after the two are grouped together?")

Another classificatory assessment is termed "Class Inclusion - Beads". A box containing 10 wooden beads, eight of which are round, two of which are square is explored by the subject. Then he is required to judge whether there are more wooden beads or more round beads in the box.

A third classificatory task is termed "Intersection of Classes". In it the subject is presented with two rows of objects. In one row all of the objects are of the same texture, but different shapes; in the other row the objects are all of the same shape but different textures. The subject must find an object which will go with both groups, i.e., that is the shape of one group and the texture of the other group and place it in the corner of the right angle which is formed when the two groups intersect.

In a fourth classificatory task, termed "Changing Criterion" the subject is provided a group of big and little, smooth and rough, squares and circles. He then is requested to sort them into two groups, i.e., place things together that go together. Following completion of the task the objects are "shuffled" and he is again requested to sort them into two groups, but groups which differ from those used in the first sorting, i.e., if the child sorted the objects into piles of squares and circles the first time, he should sort them into objects which are smooth or rough, or large or small the second time. In his third sorting of the objects he should sort them on the third criterion, the one not previously used. Each of these classificatory tasks require flexibility of thought, the ability to group and regroup objects, to categorize and subcategorize, to classify and reclassify.

Spatial orientation and mental imagery are involved in two assessments that measure the ability to rotate a mental image of an object prior to its actual rotation. Assessments that involve this operativity and sumbolic imagery include Rotation of Squares and Rotation of Beads. In the assessment termed Rotation of Squares the subject is required to anticipate the location or position of two squares, one smooth and one rough in texture, i.e., to describe their positions as they would be if they were rotated in the same manner as clock hands. In the task the subject is asked to select a card that contains the position of the squares as they would be if one square were rotated to a specific position, e.g., to the position the large hand on a clock would be if it were four o'clock.

In the second task three differently shaped wooden beads are mounted on a stiff wire and exhibited to the student. The wire containing the beads is then placed in a tube and the tube is rotated. The subject's task is to judge which of the three beads will emerge first from the tube after its rotation.

Formal or abstract thought involves the ability to reason abstractly and/or to hypothesize ways in which an answer may be obtained. It also involves the ability to carry out actions that will check these hypotheses. Formal thought is required in an assessment which involves combinatory logic. In the task, which involves combination of liquids, five identical bottles, each filled with a colorless liquid, are placed on a table. Three bottles contain chemicals that, when mixed together, produce a brown-red color. The fourth bottle contains a neutralizer; the fifth water. The task is to determine which of the three liquids should be combined to obtain the brown-red color. (When working with the blind, examiner reports whether or not a change in color occurs as various combinations of liquid are achieved.)

As a person responds to these tasks, his answers, and more importantly, the reasons for these answers, are solicited. These replies reveal his thought processes, his level of reasoning.

The purpose of today's presentation is to report on the deficits in reasoning which were found to characterize the functioning of congenitally blind pupils, and then to describe the procedures which were developed to remediate these deficits in reasoning. Specifically,

Mr. Carl Grube will present an Analysis of Project Results,

Mrs. Jo Hitt will provide a Pre-publication Review of the Teacher Training Manual,

Mr. Joseph R. Fitzgerald will present a Demonstration of Activities Designed to Promote Cognitive Growth, and

Mr. Richard E. Smith will provide an Overview of a Teacher Training Program Designed to Prepare Teachers for Implementation of a Piagetian Reasoning Program.

Following this you will contribute your discussion and questions.